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**PHASE I REPORT  
WATER POLLUTION INVESTIGATIONS FOR  
CALUMET CONTAINERS**

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## 1.0. INTRODUCTION

This report contains a review of the existing hydrogeological conditions and a preliminary analysis and assessment of potential water pollution problems at the Calumet Containers plant site. The facility is located at 136th Street and the State Line, in Hammond, Indiana. The principal activity at the plant is the reclamation of used drums and pails that contain wastes from the paint, solvent, coatings, ink, and graphic arts industries.

On 1 May 1979, the plant site was inspected by a WAPORA Geologist/Soil Scientist and a field technician. Sludge, soil, and water samples were collected for chemical analysis. The locations of the samples collected and the results of the laboratory analysis are presented in subsequent sections. The chemical analysis was performed to identify the types of contaminants that may be present in waste materials associated with the operations of the plant and to ascertain the possibility of pollution of the surface water and groundwater in the vicinity of the plant. Identification of the sources of such pollutants is beyond the scope of this report.

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## 2.0. REVIEW OF HYDROGEOLOGICAL CONDITIONS

### 2.1. Physiography and Topography

The Calumet Containers plant site is a triangular tract of land located in the northwest quarter of Section 24, T37N, R10W, Lake County, Indiana. It is bounded on the west by the Indiana/Illinois State Line, on the southeast by the Indiana Harbor Belt Railroad, and on the northeast by 136th Street.

The area is characterized by nearly level to slightly depressional topography. Ponded water occurs in shallow depressions throughout much of the area after periods of rainfall. There is a small pond, surrounded by a marsh, in the northeastern part of the site. This pond apparently is artificial, although the marsh may be natural.

✓ The color of the ponded water throughout the site typically is green. The ditches adjacent to the Indiana Harbor Belt Railroad contain greenish water and rust-colored sediment that are associated with biological growths. ✓ Sources of potential contamination are numerous. These include sludges associated with barrel-cleaning operations, wastes associated with railroad activities, contaminants that may be present in fill materials, and paint sludges and solvents that have spilled from the numerous containers that are scattered throughout the site.

### 2.2. Geology

The surficial geology of the Calumet region is characterized by 90 to 100 feet of glacial drift (King 1979; Piskin and Bergstrom 1975) overlying dolomite of the Niagaran Series (Middle Silurian) (Willman and others 1975). The glacial drift is divided into two units. The unit overlying the bedrock surface is approximately 70 to 75 feet thick. It consists of silty, sandy clay till that contains discontinuous lenses of sand and gravel and a basal layer of sand and gravel (King 1979).

The upper unit consists of 15 to 20 feet of beach and shoreline deposits. The sediment is predominantly fine to medium, somewhat silty sand that locally may be coarse-grained and pebbly. Interbedded zones of fine gravel, silt, and clay also occur within this unit (King 1979).

### 2.3. Soils

Two major soils are present at the site. The northern third of the site is characterized by marsh (Soil Conservation Service 1972). [A visual inspection indicated that these soils have a loamy texture and a high organic content.] The southern two-thirds of the site contains soils of the Oakville-Tawas complex, which consists of very poorly drained and excessively drained soils that formed in organic materials and sandy mineral soil materials. This complex consists of approximately 45% Oakville fine sand, approximately 45% Tawas muck, and approximately 10% Maumee loamy fine sand. These soils are characterized by very rapid permeabilities.

Throughout most of the site (excluding the marsh area in the northeastern part), the natural soils are overlain by several feet of fill material that contains mixtures of clay, silt, sand, gravel, slag, cinders, and other unidentifiable materials.

The ground surface over most of the site is characterized by a layer of coarse slag. It appears that paint sludges, oils, and solvents have accumulated on the surface in many parts of the site. Infiltration rates in these areas may be very low, due to the accumulation of sludges and to compaction by heavy machinery.

### 2.4. Groundwater

Groundwater on the site occurs in sands and gravels of the beach and shoreline deposits, in layers and lenses of sand and gravel associated with the lower till unit, and in fractures, solution channels, and bedding planes

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of the dolomite bedrock. However, the groundwater system of primary concern is that associated with the beach and shoreline deposits.

The Calumet aquifer consists of the sands and gravels of beach and shoreline deposits and the soils that formed over these deposits. It is approximately 15 to 20 feet thick and is underlain by glacial till. It is not known if there is leakage through this till unit. Groundwater occurs under water table conditions and is recharged by precipitation. Recharge may occur through infiltration from lakes, streams, and wetlands, or through direct infiltration through soils or other surface materials. It can be assumed from the elevations of the bodies of surface water in the area that the regional groundwater flow is to the north and northeast. The local groundwater flow may be very different, but cannot be determined from the data available. The depth to the water table at the site ranges from less than 1 foot at the marsh in the northeastern part of the site to about 4 feet in areas of higher elevation.

#### 2.5. Surface Water

Numerous bodies of surface water exist in the vicinity of the plant site. Wolf Lake is located about 0.3 mile north of the plant. A wetland area approximately 0.1 mile west-southwest of the plant has been designated as a spawning area for Powder Horn Lake (King 1979). Numerous marshes and small lakes occur to the east. There is small pond in the northeastern part of the plant site.

It appears from the available data that the water levels of the surface water bodies in the vicinity of the plant site reflect the water table condition. During dry periods, these bodies of surface water may act as areas of discharge. During periods of rainfall, however, these bodies may act as groundwater recharge areas. Therefore, any contaminants from the site could

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enter the groundwater system through the wetland area in the northeastern part of the site.

#### 2.6. Water-well Records

There are no water-well records available for Sections 24 and 13 of T37N, R10W (By telephone, Ms. Pat Starks, Indiana State Geological Survey, Bloomington, Indiana, to Mr. Kent Peterson, WAPORA, Inc., May 1979). Also, there are no water-well records available for Section 32, T37N, R15E and Section 5, T36N, R15E (By telephone, Mr. Bill Dixon, Illinois State Geological Survey, Warrenville, Illinois, to Mr. Kent Peterson, WAPORA, Inc., May 1979).

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### 3.0. COLLECTION AND ANALYSIS OF SAMPLES

#### 3.1. Locations of the Sampling Stations

On 1 May 1979, 11 samples were collected for chemical analysis. The approximate locations of the sampling stations are described in Table 1.

Samples (No. 1A and No. 1B) were taken from the sludge containment tank located at the exit of the conveyor operation at the rear of the plant. Sample No. 1A was taken in the early afternoon and Sample No. 1B was taken in the late afternoon, to account for variation in the composition of the sludge during the day. Two samples (No. 2 and No. 3) were taken from residues (soils) that have accumulated on the ground surface in proximity to the conveyor operation. Sample No. 2 was taken from residues (soils) that were approximately 14 feet west of the sludge containment tank. Sample No. 3 was taken from residues (soils) that were approximately 30 feet southeast of the sludge containment tank. Two water samples (No. 4 and No. 5) were taken from ponded water in the vicinity of the conveyor operation. One water sample (No. 6) was taken from ponded water near abandoned containers in the yard. The approximate locations of samples Nos. 4, 5 and 6 are described in Table 1.

The above seven samples were collected in the vicinity of the conveyor, operation area to determine if contamination is associated with that operation and to characterize any such contamination. Four additional samples were collected to determine the approximate chemical composition of the environment surrounding the Calumet Containers plant. Sample No. 7 was taken from the southeast area of the pond located near the entrance to the plant site. A hole was dug approximately 15 feet southeast of the pond and a soil sample (No. 8B) was collected. Approximately 30 minutes later, after groundwater had ponded in the hole, a groundwater sample (No. 8A) was collected.



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## 1. Locations of the sampling stations.

<u>Station/Sample Number</u>	<u>Sample Type</u>	<u>Approximate Location</u>
1A	Sludge	Sludge containment tank at the exit of the conveyor operation; sample taken in early afternoon.
1B	Sludge	Sludge containment tank at the exist of the conveyor operations: sample taken in the late afternoon.
2	Residue (soil)	15 feet west of the sludge containment tank
3	Residue (soil)	30 feet southeast of the sludge containment tank.
4	Surface water	65 feet northwest of the sludge containment tank; sample taken from pool of standing water
5	Surface water	50 feet northwest of the sludge containment tank; sample taken from pool of standing water.
6	Surface water	200 feet northeast of the plant building, between parked trailers and barrels; sample taken from pool of standing water.
7	Surface water	Southeastern part of the pond located near the entrance to the plant site.
8A	Groundwater	15 feet southeast of the pond near the entrance to the plant site.
8B	Soil	15 feet southeast of the pond near the entrance to the plant site.
9	Surface water	Southwest of the plant building; sample taken from the wetland around Powder Horn Lake.

Sample No. 9 was collected from the wetland area around Powder Horn Lake.

The approximate locations of the sampling stations are shown in Figure 1.

### 3.2. Results of the Chemical Analysis

The 11 samples collected were analyzed at WAPORA's laboratories (located at Berwyn, Pennsylvania) for all parameters except PCBs, benzene, toluene, and xylene. These parameters were analyzed at the Greenwood Laboratories, Kennett Square, Pennsylvania. The Greenwood Laboratories report is included in Appendix A, and the analysis results are summarized in Table 2. The US-EPA water quality criteria for domestic water supply (US-EPA 1976) also have been included in Table 2 because the State of Indiana requires that these criteria be among the documents used to establish water quality standards for toxic and/or persistent substances. The natural range of the chemical parameters identified from the samples in surface water, the typical range of these parameters in groundwater, and the typical range of these parameters in soils also are given in Table 2.

The relative mobilities of the different chemical parameters also are presented in Table 2. Mobility is defined as the ease with which an element can move within a specific environment. Highly mobile elements tend to stay in solution and to move with the water. These elements have the highest potential for water pollution. Immobile elements tend to precipitate and to be removed from solution.

Mobility is affected by many factors, including pH and oxidation potential (Eh). The mobilities presented in Table 2 are for neutral to slightly alkaline waters with a neutral Eh. These conditions probably are representative of the waters that were sampled. If reducing conditions occur, the mobilities for the elements that were tested would be considerably lower.

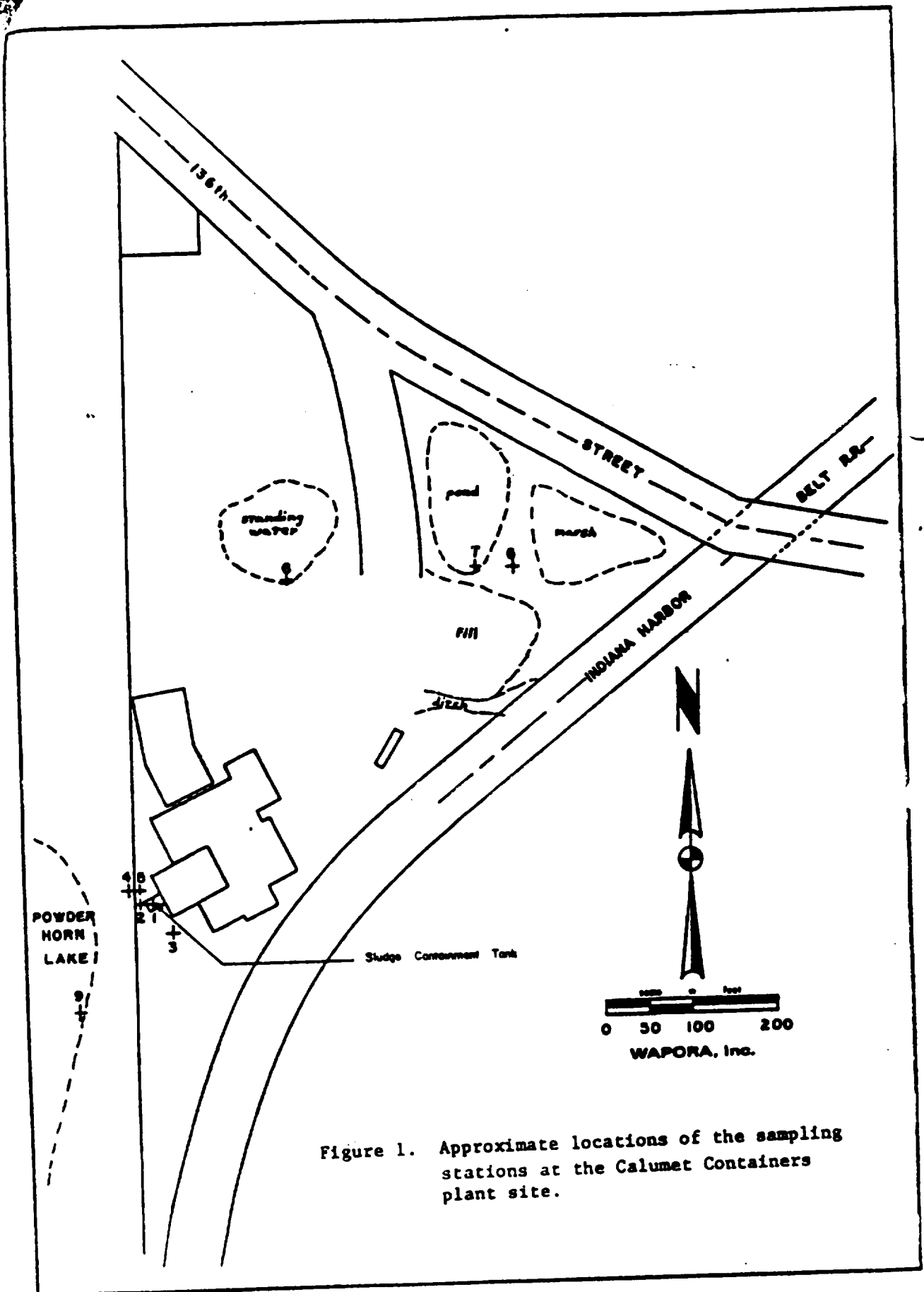


Table Results of the chemical analysis.

Sample No.	Material	Pb μg/g (ppb)	Cd μg/g (ppb)	Pb μg/g (ppb)	Cu μg/g (ppb)	Cr μg/g (ppb)	Zn μg/g (ppb)	Ni μg/g (ppb)	Hg μg/g (ppb)	Mn μg/g (ppb)	Se μg/g (ppb)	Co μg/g (ppb)
1A	Sludge	171	198	31,000	4,000	19,000	21,000	5,600	<0.01	655	400.0	6.9
1B	Sludge	108	56	<5,000	2,000	10,000	20,000	8,700	<0.01	530	400.0	4.6
2	Residue <sup>a</sup>	7.5	2.9	2,500	170	365	580	17	0.002	77	4.7	0.8
3	Residue <sup>a</sup>	15.5	81	2,700	1,200	2,100	6,800	813	0.014	<5	5.2	<0.1
4	Surface water	75	2.3	143	130	446	220	40	0.023	100	70	1.0
5	Surface water Run 1	100	11.0	285	72	562	1,180	35	0.034	128	80	25.0
	Run 2	95	14.2	--	75	581	--	36	--	127	--	--
6	Surface water	18.7	3.6	72	95	72	620	16	0.023	147	39.8	15.0
7	Surface water	27.5	<1.0	<10	16	15	90	13	0.018	104	43.0	4.2
8A	Groundwater	24.1	<1.0	28	57	17	300	22	<0.010	70	50.5	<1.0
8B	Soil <sup>a</sup>	11.6	<1.0	4,200	32	30	240	25	<0.0002	56	<0.1	<0.1
9	Surface water	24.3	<1.0	14	<10	<10	50	15	0.015	72	33.9	<1.0
Relative mobility <sup>a</sup> Criteria for domestic supply <sup>b</sup>		M	M	L	L to I	L to I	L to I	L to I	L to I	L	V. H.	L to I
Natural range in surface water <sup>b</sup>		50	10	50	1,000	50	5,000	NL	2	1,000	10	50
		5-336	<1	1-10	0-280	1-112	0-1,153	$\frac{3-86^c}{5-900}$	<0.1	$\frac{<0.6-10^d}{100-3,000}$	$\frac{<1^e}{50-300}$	--
Typical range in ground- water <sup>f</sup>		<1	0.01-100	0.01-100	0.01-100	0.01-100	0.01-100	0.01-100	--	0.01-100	0.01-100	1
Typical range in soils (ppm) <sup>g</sup>		1-50	1	2-200	2-100	5-1,000	10-300	5-500	0.03	100-3,000	0.2	0.1

<sup>a</sup> Davison (1974): V. H. = very high, M = moderate, L = low, I = immobile.

<sup>b</sup> US-EPA (1976).

<sup>c</sup> Dissolved nickel/suspended nickel.

<sup>d</sup> Typical range for domestic water supplies/upper limits in western and midwestern states.

<sup>e</sup> Low selenium areas/seleniferous areas.

<sup>f</sup> Davis and DeWiest (1966).

<sup>g</sup> Concentrations reported in milligrams per kilogram (mg/kg)  
NL = no limit.



Strongly reducing conditions probably would not be encountered in the shallow groundwater of this area, because the groundwater is recharged readily by precipitation. However, the groundwater environment may be reducing with respect to many of the chemical constituents.

The presence and concentrations of the various chemicals in the samples collected are discussed in the following paragraphs.

- Arsenic (As). Concentrations of arsenic in sludges, residues and soils tested were not high. The concentrations of arsenic in some natural waters may even exceed the concentrations shown in Table 2 (US-EPA 1976). ✓ The groundwater sample tested had an arsenic concentration of 24.1 parts per billion (ppb) which is greater than the typical concentration of arsenic in groundwater of less than 1 ppb (Davis and DeWiest 1966). Arsenic has a moderate mobility in a neutral to alkaline environment (Levinson 1974)
- Cadmium (Cd). ✓ The concentrations of cadmium in one sludge and one residue sample were higher than the concentrations of arsenic. ✓ In the other sludge and residue samples, however, the concentrations of cadmium were lower than the concentrations of arsenic. Cadmium has a moderate mobility, similar to that of arsenic. However, the concentrations of cadmium in the natural surface water, the groundwater, and the soil in the vicinity of the plant site were less than the detectable limit
- Lead (Pb). Concentrations of lead in the sludge and residue samples were extremely high. ✓ Concentrations of lead in the ponded surface water in the vicinity of the conveyor operation also were high. Concentrations of lead in surface waters away from the conveyor operation were in the upper limits of the range in natural waters, but were less than the US-EPA criterion for domestic water supply. Lead has a low mobility. ✓ Lead apparently was being removed from the runoff water and concentrated in the soils and sediments or residues. The concentrations of lead in the soils near the pond on the plant site were extremely high
- Copper (Cu). Concentrations of copper were high in the sludges and residues. The range of mobility of copper is low to immobile. The concentrations of copper in the water samples analyzed were within natural limits and less than the US-EPA criterion. The concentration of copper in the water sample taken from the wetland area around Powder Horn Lake was less than the detectable limit

- Chromium (Cr). Concentrations of chromium were high in the sludge and residue samples. ✓ Chromium concentrations in the ponded surface water in the vicinity of the conveyor operation were high, but concentrations in the surface waters away from the conveyor operation were less than the natural limit. The range of mobility of chromium is from low to immobile
- Zinc (Zn). Concentrations of zinc were high in the sludge and residue samples. Zinc has a low to immobile range of mobility. ✓ The concentration of zinc in the soil near the on-site pond was close to the upper end of the natural range. Moderate concentrations of zinc in the natural waters of the area were within the natural range and less than the US-EPA criterion
- Nickel (Ni). The concentrations of nickel were high in the sludge samples and in one of the residue samples. The concentrations of nickel in the surface waters were low. Nickel has a low toxicity, and no limit has been set by the US-EPA for the concentration of this metal. Because the mobility of nickel ranges from very low to immobile in a neutral to alkaline environment, most of the nickel present at the site probably was removed from solution
- Mercury (Hg). Concentrations of mercury were low in all the samples tested. The range of mobility of mercury is low to immobile
- Barium ( $\text{Ba}^{2+}$ ). Barium was present in moderate amounts in the sludge and residue samples. Barium has a low mobility. Concentrations of barium in the surface water samples were high, but were within the natural upper limits for domestic water supplies in the western and midwestern states and were less than the US-EPA criterion
- Selenium (Se). Concentrations of selenium were very high in the sludge samples but low in the soil and residue samples. ✓ The concentrations of selenium in all the surface water samples exceeded the US-EPA criterion for domestic water supplies. ✓ High selenium concentrations present the most severe water quality problem of all the parameters tested. ✓ The US-EPA has set a low limit for selenium concentration because of the highly toxic character of this element. In aerated water with a pH greater than 6.6, most selenium exists in the form of the selenite anion ( $\text{SeO}_3^{2-}$ ) (Hem 1970). Under mildly reducing conditions, the equilibrium species is elemental selenium. ✓ Selenium in surface waters probably exists as  $\text{SeO}_3$  and is highly mobile. In groundwater, however, it probably exists as elemental selenium and has a very low mobility (Levinson 1974). ✓ Therefore, surface runoff probably is the primary contributor of selenium to surface waters

- Silver (Ag). The concentrations of silver were low in all the samples tested. Silver has a low to immobile range of mobility, and the potential for groundwater pollution is slight
- Polychlorinated biphenyls (PCBs). The concentrations of PCBs in all samples tested were less than the detectable limit for the test method used. The method is described in the 10 May 1979 letter from Greenwood Laboratories, which is included in Appendix A
- Aromatics (benzene, toluene, xylene). Aromatics were present in the sludge and residue samples (the soil close to the conveyor operation). The concentrations of toluene and xylene were high. Aromatics were not detectable in the soil close to the on-site pond. If detectable concentrations were present in the water samples, a noticeable odor also would have been present. No odor was detected from any of the water samples. Aromatics are highly volatile, and concentrations in water would decrease very rapidly
- Total Organic Carbon (TOC). Low concentrations of total organic carbon were present in the sludge and residue samples. This indicates that organic compounds do not constitute a sizeable fraction of the waste. TOC concentrations were high in the samples of the standing surface water from the site. It appears that other sources may contribute to the high TOC concentration in these waters, such as human waste (urine) in the yard area
- Cyanide (CN). Concentrations of cyanide were not high in the sludge and residue samples. ✓ The cyanide concentration in the water sample taken from the wetland around Powder Horn Lake exceeded the US-EPA criterion for fresh water and aquatic life. ✓ The concentration of cyanide in this sample was considerably higher than the concentrations in the surface water and groundwater samples taken at the plant site. ✓ It is possible that other sources of contamination may exist near Powder Horn Lake. mab
- pH. The pH of each sample was measured in the laboratory, and thus the values shown in Table 2 do not represent the true conditions in the field
- Total Dissolved Solids (TDS). ✓ Total dissolved solids generally are associated with freshwater systems. They include inorganic salts, small amounts of organic matter, and dissolved materials. TDS concentrations in the water samples tested ranged from 474 to 1,450 milligrams per liter (mg/l). ✓ These values are higher than the recommended maximum TDS concentration of 500 mg/l for drinking water. TDS concentrations are affected by many factors, and



the concentrations found in the water samples tested are not abnormally high

- Oil and grease. ✓ Concentrations of oil and grease were high in the water samples tested. The values ranged from 28 to 89 mg/l. ✓ According to the US-EPA criterion, a domestic water supply should be virtually free from oil and grease. ✓ The oil and grease found in the water samples could have come from many different sources, such as leaks from trucks and trailers, railroad yard operations, etc.
- Chemical Oxygen Demand (COD). ✓ The result of a test for COD is used as a general indicator of the pollution potential of domestic and industrial wastes. This test involves the measurement of the total quantity of oxygen required for oxidation of the waste to carbon dioxide and water. ✓ The COD of the sludge, residue and soil samples was very high, but the COD of the water samples analyzed was not as high. This can be interpreted to mean that the sludge residue and soil samples required more oxygen for oxidation than the water samples, and that sludges, residues, and soils have higher strengths of industrial pollution.

### 3.3. On-site Drainage

As mentioned in Section 2.1., the Calumet Containers site is characterized by very poor drainage, due to relatively impermeable surface materials and a nearly level to depressional topography. This condition contributes to the unsightly appearance of the site and also restricts the infiltration and runoff of contaminants. ✓ Although the amount of infiltration and runoff is expected to be small, it may be significant. ✓ Runoff quantities and infiltration rates have not been determined for the site.

### 3.4. Water Quality Records for Powder Horn Lake

There are no water quality records available for Powder Horn Lake (By telephone, Mr. Robert Schacht, Division of Water Pollution Control, Illinois Environmental Protection Agency (IEPA), Maywood IL, and Mr. Dave McGinty, Cook County Forest Preserve District, River Forest IL, to Mr. J.P. Singh, WAPORA, Inc., May 1979). Mr. Robert Wengrow of the Division of Land/Noise Pollution Control, IEPA, Aurora IL, reported that his office has no

water quality records for Powder Horn Lake, but that IEPA personnel collected and analyzed three samples in the vicinity of the Calumet Containers site during October 1978. The data from the analysis of these samples are summarized in Table 3.

The results of these samples indicate that PCBs were present in two samples. The concentration in the third sample was below the detectable limit. Selenium was not detected. The IEPA test results were reported in parts per million (ppm) instead of parts per billion (ppb). The concentrations of lead and COD were high in samples collected near the railroad tracks.

### 3.5. Indiana State Board of Health Reports

Mr. Bruce Palin of the Solid Waste Management Section and Mr. Joseph Snyder of the Division of Water Pollution Control of the Indiana State Board of Health were contacted to obtain past and present pollution surveillance reports for the Calumet Containers plant. Mr. Palin sent copies of laboratory analysis reports for two soil samples that were collected on 17 October 1978. Mr. Snyder sent copies of laboratory analysis reports for two water samples that were collected on 13 March 1979. No surveillance reports were sent. Both sets of laboratory analysis reports are barely legible, and thus the data in the reports could not be analyzed. Copies of these laboratory analysis reports are included in Appendix B.

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Table 3. Summary of IEPA sampling results.

Sample No.	1	2	3
Date Collected	17 October 1978	17 October 1978	17 October 1978
Time Collected	11:15 AM	11:30 AM	11:45 AM
Location	West side of RR tracks	From swamp 200-250 yards from plant	East side of RR tracks due west of plant
Sample appearance	Brownish	Clear-yellowish	Brownish
Alkalinity <sup>1,2</sup>	4,400.	240.	4,200.
Ammonia	2.4	0.27	14.
Arsenic	0.075	0.005	0.018
Barium	0.6	0.1	1.0
Boron	8.0	0.8	9.5
Cadmium	0.13	0.00	0.09
Calcium	44.	44.	92.
COD	12,780.	115.	16,980.
Chloride	880.	145.	750.
Chromium Cr (tot)	7.8	0.00	8.8
Chromium Cr <sup>+6</sup>	Interference	0.00	Interference
Copper	1.0	0.00	0.95
Cyanide	1.6	0.00	--
Fluoride	15.2	0.9	14.2
Hardness CaCO <sub>3</sub>	80.	340.	300.
Iron	25.	15.	17.
Lead	7.4	0.04	12.8
Magnesium	20.	52.	60.
Manganese	0.84	0.30	1.56
Mercury	Interference	0.0000	Interference
Nickel	0.2	0.0	0.2
Nitrate-nitrate N	0.5	0.1	0.6
Oil and grease	112.	1.	Emulsion
pH	9.5	8.1	9.0
Phosphorus	9.2	0.66	8.8
Potassium	100.8	26.	68.8
Selenium	0.00	0.00	0.00
Silver	0.00	0.00	0.00
Sodium	1,400.	88.	2,700.
Sulfate	320.	84.	500.
Zinc	15.5	0.0	19.2
PCB (ppb)	42.	Not detected	37.

<sup>1</sup>Alkalinity is determined as ppm of CaCO<sub>3</sub> at pH 4.5.<sup>2</sup>All parameters are recorded in parts per million (ppm) unless otherwise indicated.

#### 4.0. Conclusions

Based on the review of hydrogeological conditions and the analysis and discussion of the laboratory results for the samples collected, it can be concluded that:

- Lead concentrations in sludges and residues were extremely high. ✓ Concentrations of lead in soils near the on-site pond also were extremely high. Lead concentrations in ponded surface waters in the vicinity of the conveyor operation were high, but concentrations in the surface waters away from the conveyor operation were less than the US-EPA criterion. The high concentrations of lead in samples of the residues and soils in the vicinity of the plant are an indication that lead is being removed from the surface water and the groundwater and concentrated in the soil and the sediments (residues)
- ✓ The concentrations of arsenic and zinc in the groundwater sample were high in comparison to the typical range of these parameters in groundwater. Although these concentrations were less than the US-EPA water quality criteria for domestic water supply, the abnormally high concentrations may be an indication that the natural waters in the vicinity of the plant may be contaminated
- Concentrations of selenium were very high in the sludge samples, but low in the residue samples. ✓ Selenium is highly toxic and has a very high mobility under reducing conditions. ✓ The concentrations of selenium in all water samples tested were in excess of the US-EPA criterion for the concentration of selenium in domestic water supplies. ✓ The waste materials associated with plant operation may be the sources of this contamination. The analysis of the three water samples taken by the IEPA did not indicate the presence of selenium. The IEPA test results were reported in parts per million (ppm) instead of parts per billion (ppb)
- Concentrations of PCBs were below detectable limits in all samples, in accordance with the test method used. ✓ Two of the water samples analyzed by the IEPA contained PCBs. The concentration in the third sample was below the detectable limit
- Aromatics (benzene, toluene, xylene) were present in high concentrations in the sludge and residue (soil close to the conveyor operation) samples. Concentrations of aromatics in the soils close to the on-site pond and away from the conveyor operation were not detectable
- ✓ TOC concentrations were low in the sludge and residue samples. ✓ High concentrations of TOC were present in the standing surface

waters on the site. It appears that sources other than plant operations may contribute to these high TOC concentrations. Other possible sources would include human waste (urine) disposal in the yard area.

- Concentrations of cyanide were not high in the sludge and residue samples. The concentration of cyanide in the water sample taken from the wetland near Powder Horn Lake was considerably higher than the concentrations in the surface water and groundwater samples taken at the plant site. This suggests that other sources of possible contamination may exist near Powder Horn Lake
- The COD concentrations in the sludge, residue, and soil samples were very high. The water samples analyzed did not have high concentrations of COD. This can be interpreted to mean that the sludges, residues, and soils at the site may have higher strengths of industrial pollution
- Drainage is poor at the plant site because of the presence of relatively impermeable surface materials and a nearly level to depressional topography. These conditions contribute to the unsightly appearance of the site and also restrict the infiltration and runoff of contaminants. The quantities of runoff and rates of infiltration have not been determined for the plant site
- It is difficult to determine the extent to which operations at the Calumet Containers plant may be contaminating the natural waters of the area, because of the following factors:
  - 1) The containers processed at the plant hold a wide variety of products. Consequently, the compositions of these sources of contamination are extremely variable
  - 2) There are numerous potential sources of environmental contamination. Some of these sources (including the container processing area, the sludges that have accumulated on the surface of the ground, and the numerous barrels present on the site) are associated with Calumet Containers. However, other potential sources of pollution include railroad operations, fill materials, surrounding industries, etc.
  - 3) The samples analyzed may not adequately represent conditions at the site, because the concentrations of possible contaminants, such as those described in this report, would vary with time and location.

## 5.0. RECOMMENDATIONS

After an examination of the hydrogeological conditions of the area and the laboratory results for the samples collected, WAPORA recommends that:

- An intensive chemical quality monitoring program be developed by Calumet Containers to monitor the composition of the sludges, the chemical quality of the residues and/or the soils in the vicinity of the plant, and the chemical quality of the surface water and groundwater at the site. The results of this monitoring would more accurately define the extent of the potential pollution problems at the plant site
- Further tests to detect concentrations of PCBs be performed on the sludges, residues, soils, surface water, and groundwater at the site. This would show whether or not the presence of PCBs in the area, as indicated by the States of Indiana and Illinois, is associated with the Calumet Containers operation
- A study be conducted to determine the quantity of runoff from the plant site and the rates of infiltration in the soil and/or fill material
- ×• A program be developed to clean up the plant yard. Calumet Containers should undertake a yard inventory to identify worthless materials. These materials should then be removed and disposed of at an approved landfill site
- Evaluations be conducted of the other activities at the plant site, as mentioned in WAPORA's proposed Plan of Study dated 8 May 1979.

## 6.0. LITERATURE CITED

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000033

**APPENDIX A**  
**GREENWOOD LABORATORIES REPORT**



# Greenwood Laboratories

## ANALYTICAL CHEMISTS AND CONSULTANTS

P. O. BOX 187  
R. D. 2

KENNETT SQUARE, PA. 19349  
PHONE: 215-388-7225

000094

TO: Mark Brandl  
Jack McCormick & Associates, Inc.  
511 Old Lancaster Avenue  
Berwyn, PA 19312

FROM: Gerald R. Umbreit, Ph.D.

DATE: May 10, 1979 GREENWOOD NO. GL 3842

SUBJECT: Examination of samples for possible content of PCBs and of certain samples for benzene, toluene and xylene content in addition.

SAMPLES: Project 089 5/1/79 - for PCBs, Benzene, Toluene, Xylenes:  
GL 3842-1: 11690 (Soil #1, Site #1 15' W.Pit Sta.)  
GL 3842-2: 11692 (Soil, Site #1, 30' Trailer Sta #1)  
GL 3842-3: 11694 (Sludge Rep. #1, Site #1, Sta. #1)  
GL 3842-4: 11696 (Sludge Rep. #2, Site #1, Sta. #1)  
GL 3842-5: 11698 (Soil, Pond Sta.#3, preservative-none)

### For PCBs only:

GL 3842-6: 11704 Site #1  
GL 3842-7: 11702 Site #4  
GL 3842-8: 11703 Site #3  
GL 3842-9: 11705 Site #5  
GL 3842-10: 11701 Site #2  
GL 3842-11: 11674 Site #3 Pond

### SUMMARY:

The water samples were examined by gas chromatography using electron capture detection for PCB content. These were prepared for analysis by extraction of 100 ml of sample with 1 ml of isooctane and the isooctane extract was actually analyzed. There is no evidence of PCBs present in these samples.

The soil samples required variable preparation because of the variation in water proportions and degree of suspension of the solids. For samples 11690 and 11692, 5 gram portions were used and 10 ml of a 1:1 mixture of hexane and acetone were added. This mixture was vigorously intermixed and allowed to stand in contact for 24 hours with intermittent shaking. Following this 2 ml of the supernatant liquid was removed and 2 ml of water added to yield an organic phase of essentially 1 ml volume of hexane. This hexane portion was used for analysis. For samples 11694, 11696 and 11698, portions of the carbon disulfide extract originally prepared for analysis of the aromatics were taken. These were concentrated by evaporation of the carbon disulfide and reconstituting to a lesser volume with isooctane.

McCormick &amp; Assoc. / Brandl

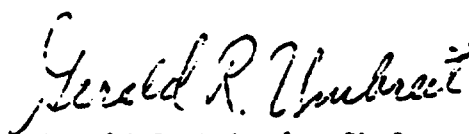
3842

May 10, 1979

In all water samples an estimated minimum detectable level for the various PCB mixtures which may be possible will range from ~10 ppb (Aroclor 1260) up to ~100 ppb (Aroclor 1221). For the soil and sludge samples these minimum detectable levels will show a corresponding 10-fold range from ~ 300 ppb to 3 ppm.

For the analysis of aromatics, samples were extracted with carbon disulfide and the extract analyzed by gas chromatography using hydrogen flame detection. Two different column systems were used to provide some degree of assurance for the identity of components corresponding to the aromatics of concern. A standard mixture containing benzene, toluene and m-, and o-xylene was used for quantitative calibration and qualitative comparison to sample components. All of the samples of concern, with the exception of #11698, showed a similar pattern of components which includes materials other than those coinciding by retention time with the aromatic components of concern. However, in most cases, peaks corresponding to toluene and m-xylene are the two largest shown in the mixture. With this approach, the following sample compositions have been determined:

Sample No.	Component % w/w		
	<u>Toluene</u>	<u>m-xylene</u>	<u>o-xylene</u>
11690	.009	.008	.003
11692	.004	.006	.003
11694	.005	.003	.001
11696	.079	.130	.029
11698	0	0	0



Gerald R. Umbreit, Ph.D.  
GREENWOOD LABORATORIES

GRU:del

000096

**APPENDIX B**

**INDIANA STATE BOARD OF HEALTH REPORTS**

000092

RECEIVED

## WATER SAMPLE IDENTIFICATION SHEET

Sample site CHICKADEE CREEK TRAILStation No. 1Sample Date 11-12-10 11-14-10 10-10 A.M./P.M.Supervisor 11-12-10 11-14-10 10-10Collector(s) 11-12-10 11-14-10 10-10Delivered to lab 11-12-10 11-14-10 10-10by 11-12-10 11-14-10 10-10NPDES NO. 11-12-10 OUTFALL 8-10

1. NPDES 11-12-10 Category of Discharge 10  
 2. SPC 18 11-12-10  
 3. WQ Study 11-12-10  
 4. Pollution complaint 11-12-10  
 5. Fish kill investigation 11-12-10

Sample Type 11-12-10  
 1. Grab 11-12-10  
 2. 24-hour comp. 11-12-10  
 3. 8-hour comp. 11-12-10  
 4. 24-hour flow comp. 11-12-10  
 5. 8-hour flow comp. 11-12-10

Sample Interval 11-12-10  
 0 - at outfall 11-12-10  
 1 - above outfall 11-12-10  
 2 - below outfall 11-12-10

Stream miles from outfall 11-12-10

## LAB INFORMATION

Lab No. 11-12-10 by 11-12-10Rec'd 11-12-10 A.M./P.M.  
NO DAY YRby 11-12-10

## CONTAINER TYPE &amp; SIZE

glass 500 ml 1 liter total no. 11-12-10  
 plastic 2 liter other 11-12-10

Standard method followed? all some none

## TEMPERATURE &amp; PRESERVATION

Samples refrigerated? all some none

Chlorinated samples? all some none

Standard method followed? all some none

Teflon capped Foul capped Solvent rinsed

TEMP 11-12-10 11-12-10 11-12-10Reported out 11-12-10

CODE	PARAMETER	UNIT	LAB DATA
01002	Alkalinity Total $\text{CaCO}_3$	mg/l	80-81
01010	Ammonia-N	mg/l	
01000	Arsenic	mg/l	
00210	$\text{BOD}_5$	mg/l	
01027	Cadmium	mg/l	11.0
00940	Chlorides	mg/l	
01032	Chromium-VI	mg/l	
01034	Chromium-Tot	mg/l	
00310	COD	mg/l	
01042	Copper	mg/l	NAT A HYPOTHESIS
00720	Cyanide-CN	mg/l	IN FERRIC
00851	Fluoride	mg/l	
01040	Iron-Total	mg/l	
01001	Lead	mg/l	6.00 mg/l
01005	Manganese	mg/l	
01000	Mercury-Total	PPB	
01000	Nickel	mg/l	
00020	$\text{NO}_3 + \text{NO}_2 - \text{N}$	mg/l	
00000	Oil & Grease	mg/l	
00401	pH (lab)		
32730	Phenol	mg/l	
00070	Phosphorus-P	mg/l	
00047	Solids - Susp	mg/l	
00401	Solids (total)	mg/l	11.7% VI
00040	Sulfate	mg/l	
00020	TAN	mg/l	
00000	TOC	mg/l	11.00 AS IS
01002	Turbidity	FTU	11.5 IS BASIS
01000	Fecal coliform	100ml	
	SOLVENTS (LIMITING)		SEE
	PCB (2)		SEE
	FLUORIDE (2)		
	11-12-10		

000098

## WATER SAMPLE IDENTIFICATION SHEET

Station No. 11

Sample Date: MO. 11-12 DAY 13-14 YR. 15-16 A.M./P.M.

Collector(s)

Delivered to lab: MO.  DAY  YR.  A.M./P.M.

DIS NO. 1-7 OUTFALL 8-10

1. NPDES 17 2. SPC 15 18 3. WQ Study  4. Pollution complaint  5. Fish kill investigation

Category of Discharge: 1. Industry  2. Semi-Public  3. Municipal  4. Federal  5. Public Water Supply  6. Other  7. Other

Sample Type: 1. Grab  2. 24-hour comp.  3. 8-hour comp.  4. 24-hour flow comp.  5. 8-hour flow comp.

Sample Interval: 20

Stream miles from outfall: 22-26

0 - at outfall  1 - above outfall  2 - below outfall

## LAB INFORMATION

Lab No. 3112 by

Rec'd 11/13/16 A.M.  P.M.

MO.  DAY  YR.  by

## CONTAINER TYPE &amp; SIZE

glass 500 ml  1 liter  total no.

plastic 2 liter  other

Standard method followed? all  some  none

## TEMPERATURE &amp; PRESERVATION

Samples refrigerated? all  some  none

Chlorinated samples? all  some  none

Standard method followed? all  some  none

Bottle capped  Foul capped  Solvent rinsed

H.M.P.

Reported on 11/13/16

CODE	PARAMETER	UNIT	LAB DATA
00410	Alkalinity Total $\text{CaCO}_3$	mg/l	31-41
00610	Ammonia-N	mg/l	
01000	Arsenic	mg/l	
00310	BOD <sub>5</sub>	mg/l	
01027	Cadmium	mg/l	
00910	Chlorides	mg/l	
01032	Chromium-Hex	mg/l	
01034	Chromium-Tot	mg/l	
00340	COD	mg/l	
01042	Copper	mg/l	
00720	Cyanide-CN	mg/l	
00951	Fluoride	mg/l	
01045	Iron-Total	mg/l	
01051	Lead	mg/l	
01055	Manganese	mg/l	
71900	Mercury-Total	PPB	
01065	Nickel	mg/l	
00630	$\text{NO}_2 + \text{NO}_3 - \text{N}$	mg/l	
00860	Oil & Grease	mg/l	
00403	pH (Temp) <u>12.1</u>		10.1/12.1/15
32730	Phenol	mg/l	11/13/16 10/16
00870	Phosphorus-P	mg/l	8.4/11.1/16
00847	Solids - Susp	mg/l	11/13/16 1/30
70401	Solids - (total)	mg/l	11/13/16 1/30
00945	Sulfate	mg/l	
00825	TKN	mg/l	
00680	TOC	mg/l	
01092	Zinc	mg/l	
71055	Fecal coliform	100ml	
00100	Temperature		54.0/57.0/58.0
00101	Specific Gravity		1.000/1.000/1.000
00102	Dissolved Oxygen		1.0/1.0/1.0
00103	Electrical Conductivity		1.0/1.0/1.0





# WATER SAMPLE IDENTIFICATION SHEET

79  
000101

File 17-14-79  
Station No. 6-1  
Sample Date 5-13-79  
NO. 11-12 DAY 13-14 YR. 15-16 A.M./P.M. 9:30  
Delivered to lab 5-14-79  
NO. DAY YR. A.M./P.M.

NPDES NO. 1-7 OUTFALL 8-10  
17 1. NPDES 2. SPC 18 3. WQ Study 4. Pollution complaint 5. Fish kill investigation  
18 Category of Discharge  
1. Industry 2. Semi-Public 3. Municipal 4. Federal 5. Public Water Supply 6. State operation 7. Other  
19 Sample Type  
1. Grab 2. 24-hour comp. 3. 8-hour comp. 4. 24-hour flow comp. 5. 8-hour flow comp.  
20 Sample Interval  
0 - at outfall 1 - above outfall 2 - below outfall  
21 Stream miles from outfall  
22-26

## LAB INFORMATION

Lab No. 0328 by CTH  
Rec'd 5-14-79 9:30 A.M./P.M.  
NO DAY YR by CTH

## CONTAINER TYPE & SIZE

glass 500 ml 1 liter total no. 1  
plastic 1-2 liter other  
Standard method followed? all some none

## TEMPERATURE & PRESERVATION

Samples refrigerated? all some none  
Chilled samples? all some none  
Standard method followed? all some none  
Folion capped? Fol capped? Solvent rinsed?  
TEMP

Reported on Excess of ammonia  
Present in lab  
3-14-79

CODE	PARAMETER	UNIT	LAB DATA
28-32 00410	Alkalinity Total CaCO <sub>3</sub>	mg/l	34-41
00610	Ammonia-N	mg/l	
01000	Arsenic	mg/l	
00310	BOD <sub>5</sub>	mg/l	
01027	Cadmium	mg/l	
00940	Chlorides	mg/l	
01032	Chromium-Hex	mg/l	
01034	Chromium-Tot	mg/l	
00340	COD	mg/l	
01043	Copper	mg/l	
00720	Cyanide-CN	mg/l	
00951	Fluoride	mg/l	
01045	Iron-Total	mg/l	
01051	Lead	mg/l	
01055	Manganese	mg/l	
71900	Mercury-Total	PPB	
01065	Nickel	mg/l	
00630	NO <sub>2</sub> +NO <sub>3</sub> -N	mg/l	
00560	Oil & Grease	mg/l	
00403	pH (lab)		
32730	Phenol	mg/l	
00670	Phosphorus-P	mg/l	
00547	Solids - Susp	mg/l	
70401	Solids (total)	mg/l	
00945	Sulfate	mg/l	
00625	TKN	mg/l	
00680	TOC	mg/l	
01092	Zinc	mg/l	
74035	Fecal coliform	100/ml	
REPORTED			
WATER			
RY			



000102

## WATER SAMPLE IDENTIFICATION SHEET

Sample Date: NOV 11-12 13 79 1  
 Station No. 700  
 Deliver to lab 3 14 79 9:30  
 by T. S. / M. R.

NPDES ID: 1-7 OUTFALL: 8-10

1. NPDES  
 2. SPC 15  
 3. WQ Study  
 4. Pollution complaint  
 5. Fish kill investigation

- Category of Discharge  
 1. Industry  
 2. Semi-Public  
 3. Municipal  
 4. Federal  
 5. Public Water Supply  
 6. Other

## Sample Type

1. Grab  
 2. 24-hour comp.  
 3. 8-hour comp.  
 4. 24-hour flow comp.  
 5. 8-hour flow comp.

Sample Interval

20

Stream miles from outfall

22-28

## LAB INFORMATION

Lab No. 0329 by C. H.  
 Rec'd 3-14-79 9:30 P.M.  
 by C. H.

## CONTAINER TYPE &amp; SIZE

glass 200 ml 1 liter total no. 1  
 plastic 1-2 liter other

Standard method followed? all some none

## TEMPERATURE &amp; PRESERVATION

Samples refrigerated? all some none

Chlorinated samples? all some none

Standard method followed? all some none

Teflon capped 1 1 1  
 Temp. 1 1 1

Reported and  
 Preserved in lab

11/14/79  
 3-14-79

B-6

CODE	PARAMETER	UNIT	LAB DATA
2872 00110	Alkalinity Total $\text{CaCO}_3$	mg/l	34.41
00810	Ammonia-N	mg/l	
01000	Arsenic	mg/l	
00310	BOD <sub>5</sub>	mg/l	✓
01027	Cadmium	mg/l	
00940	Chlorides	mg/l	
01032	Chromium-Hex	mg/l	
01034	Chromium-Tot	mg/l	✓
00340	COD	mg/l	✓
01042	Copper	mg/l	
00720	Cyanide-CN	mg/l	
00061	Fluoride	mg/l	
01045	Iron-Total	mg/l	
01051	Lead	mg/l	
01055	Manganese	mg/l	
71900	Mercury-Total	PPB	
01065	Nickel	mg/l	
00630	$\text{NO}_2 + \text{NO}_3 - \text{N}$	mg/l	REPORTED
00660	Oil & Grease	mg/l	
00403	pH (bb)		7.3
32730	Phenol	mg/l	MADE IN MEXICO
00670	Phosphorus-P	mg/l	MADE IN MEXICO
00347	Solids - Susp	mg/l	
70401	Solids (total)	mg/l	
00945	Sulfate	mg/l	
00625	TKN	mg/l	
00680	TOC	mg/l	✓
01092	Zinc	mg/l	
71055	Fecal coliform	100ml	

Sample D0529

000103

① The sample was analyzed for the following organic compounds (using gas chromatography):

- a) methyl ethyl ketone
- b) ethyl acetate
- c) acetone
- d) ethylene glycol
- e) carbon tetrachloride

② Irradiation of the sample by U.V. caused fluorescence.

-4 3-27-79